AMENDED CLAIMS

1. A process for the removal of sulphur compounds from a hydrocarbon stream, especially a gaseous hydrocarbon gas stream, comprising said sulphur compounds, which process comprises contacting said gas stream with an adsorbent comprising a zeolite having a pore diameter of at least 5 Å to adsorb the sulphur compounds thereon, the adsorption process followed by a regeneration process in the presence of water of used, loaded adsorbent, by contacting the said loaded adsorbent with a regeneration gas stream having a relative humidity of at most 30%, wherein the regeneration gas is an inert gas or an inert gas mixture.

2. A process according to claim 1, in which the hydrocarbon stream is natural gas, associated gas, a natural gas liquids stream, a natural gas condensate stream or a refinery gas stream.

3. A process according to claim 1 or 2, in which the sulphur compounds are hydrogen sulphide, carbonyl sulphide, mercaptans, especially C_1-C_6 mercaptans, organic sulphides, especially di-C_1-C_4-alkyl sulphides, organic disulphides, especially di-C_1-C_4-alkyl disulphides, thiophene compounds, aromatic mercaptans, especially phenyl mercaptan, or mixtures thereof, preferably mercaptans, more especially C_1-C_4 mercaptans, the total amount of sulphur compounds preferably being up to 3 vol% based on total gas stream, more preferably up till 1.5 vol%, more preferably up till 0.1 vol%, still more preferably between 1 and 700 ppmv, most preferably between 2 and 500 ppmv.

4. A process according to any of claims 1 to 3, in which the gas stream also comprises water, preferably is saturated with water, water preferably being removed before the removal of the sulphur compounds, more preferably by adsorbing the water on a zeolite having a pore diameter of less than 5 Å, even more preferably having a pore diameter of 3 or 4 Å.

5. A process according to any of claims 1 to 4, in which the gas stream also comprises hydrogen sulphide and optionally carbon dioxide, preferably up till 2 vol% hydrogen sulphide, more preferably up till 0.5 vol% hydrogen sulphide, the hydrogen sulphide and part of the carbon dioxide preferably being removed by means of washing the gas stream with a chemical and/or physical solvent, more preferably with an aqueous alkaline solution, even more preferably with an aqueous amine solution.

6. A process according to any of claims 1 to 5, in which the temperature of the zeolite adsorption process is between 10 and 60 °c, the pressure is between 10 and 150 bara, and the superficial gas velocity is between 0.03 and 0.6 m/s, preferably between 0.05 and 0.40 m/s.

7. A process for the regeneration of adsorbent comprising a zeolite having a pore diameter of at least 5 Å loaded with sulphur compounds by contacting the adsorbent with a regeneration gas stream having a relative water humidity less than 100%, especially less than 80%, suitably for a period up till 24 hours, preferably up till 12 hours.

8. A process according to any one of claims 1 to 7, in which the adsorbent comprises zeolite dispersed in a binder, preferably a molsieve, the zeolite preferably of zeolite type a or zeolite type X.

9. A process according to any of claims 1 to 8, in which the adsorbent is in the form of at least two beds, one bed comprising zeolite having a pore diameter of 5 Å, preferably 3 or 4 Å, the second and, if present, further beds comprising a zeolite having a pore diameter of more than 5 Å, preferably at least 6 Å, more preferably molsieve 13X.

10. A process according to any of claims 1 to 9, in which the regeneration is carried out at a pressure between 1 and 150 bara, a temperature between 200 and 400 °c, preferably between 230 and 350 °C, and a superficial gas velocity of less than 0.20 m/s, preferably between 0.02 and 0.15 m/s, the regeneration gas stream preferably being nitrogen, hydrogen or a hydrocarbon gas stream, more preferably a treated gas stream which is obtained by a process according to any of claims 1 to 9.

11. A process according to any of claims 1 to 10, in which the regeneration gas stream is a gas stream obtained by saturating the stream at a temperature below the regeneration temperature, preferably at least 50 °C below the regeneration temperature, more preferably 75 °C below the regeneration temperature.

12. A process according to any of claims 1 to 11, in which the regeneration gas stream has a relative humidity between 0.1 and 30%.

13. A process for reducing the degradation of a sulphur loaded adsorbent, wherein the sulphur loaded adsorbent is regenerated in the presence of water by contacting the said loaded adsorbent with a regeneration gas stream having a relative humidity of at most 100%, wherein the regeneration gas is an inert gas or an inert gas mixture.